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NOTE BY THE SECRETARY-GENERAL

The Secretary-General has the honour to transmit to the members of the Security Council the attached communication which he has received from the Acting Director-General of the International Atomic Energy Agency (IAEA).

Annex

Letter dated 12 May 1992 from the Acting Director-General of the International Atomic Energy Agency addressed to the Secretary-General

Please find attached the report of the eleventh IAEA inspection in Iraq under Security Council resolution 687 (1991). You may deem it appropriate to transmit the report to the members of the Security Council. The Director-General remains, of course, available with the Chief Inspector, Mr. Demetrius Perricos for any consultations you or the Council may wish to have.

(Signed) Noramly bin MUSLIM
Acting Director-General

Appendix

REPORT ON THE ELEVENTH IAEA ON-SITE INSPECTION IN IRAQ
UNDER SECURITY COUNCIL RESOLUTION 687 (1991)

7 - 15 April 1992

SALIENT POINTS

- An important objective of this mission was the destruction of key technical installations comprising buildings and equipment at the Al Atheer-Al Hatteen site some seventy kilometers southwest of Baghdad. The Al Atheer-Al Hatteen complex had been identified by the Agency as the site where Iraq intended to pursue its main effort in developing nuclear weapons.

  Eight buildings, covering a surface of approximately 35 000 square meters, and 29 equipment items, some consisting of several components, were designated for destruction. In view of the extensive preparatory work required for the demolition operation, it was possible to complete the destruction of only about 24 000 square meters of buildings; however, most of the equipment was destroyed. The remaining buildings and equipment are now being prepared so that they can be destroyed during the next mission.

  The techniques employed: explosive charges (in total 3.5 tons of dynamite) were used; a large bunker was filled with concrete (350 cubic meters were poured); and cutting torches were used for steel constructions and equipment.

  The Iraqi side provided all equipment, materials and manpower necessary for ensuring efficient fulfillment of the destruction plan under the supervision of the IAEA team.

  An equally important objective related to the transfer of irradiated fuel into new storage tanks located above-ground. This was necessary in order to prevent further deterioration of the fuel due to flooding by rain and groundwater. This operation required four days of intensive work under close supervision of the IAEA inspectors to ensure the continuity of custody of the highly enriched uranium contained in the fuel.

- Meetings were held on nuclear material accountancy to clarify remaining discrepancies between inspection findings and Iraqi declarations. This resulted in new information on quantities and flows of material. Further assessment is needed in order to arrive at a final and complete nuclear material flowchart.

- No progress can be reported as regards the Iraqi position on providing information about the procurement of maraging steel and the carbon fibre rotors. The sources of technical advice from outside Iraq on the centrifuge enrichment program also remain to be identified. The Iraqi authorities stated that these issues would be resolved during the next inspection mission. Replies obtained from the Iraqi counterparts, after repeated questioning, clearly indicate that the political decision to open this file to the inspectors has yet to be taken.

- Discussions held on the weapons development programme resulted in little progress. The Iraqi side argued that the inconsistencies and contradictions noted by the inspectors were the benefits of hindsight from a technologically privileged position. In comparison to the comprehensive and well organized efforts to produce fissile material, this programme, as declared, still appears incomplete to the inspectors. The die declared to have been used at Al Qa Qaa to manufacture the explosive lenses with which experiments were conducted at the Al Hatteen bunker was presented and removed to the IAEA's Headquarters in Vienna.

- A number of previously inspected sites were revisited to complete the inventory and manufacturer identification of equipment and machine tools used or capable of use in the Iraqi nuclear programme.

- Discussions were also held on the draft report submitted by Iraq in March on its nuclear programme (the "full, final and complete report", referred to by the Iraqi side as the FFC) and on the implementation of the plan for future ongoing monitoring and verification. The Iraqi authorities, who are planning to submit a revised version of the FFC to the IAEA soon, proposed another meeting before finalization of that document. They requested that the IAEA provide clarification of a number of items identified in Annex 3 of the long-term plan.

INTRODUCTION

1. This report summarizes the findings of the eleventh inspection mission carried out by the IAEA under Security Council resolution 687 (1991) with the assistance and co-operation of the Special Commission of the United Nations. The mission took place from 7 to 15 April 1992 and was headed by Mr. Demetrius Perricos of the IAEA as Chief Inspector. The team consisted of 21 inspectors and 5 supporting staff; it comprised 18 nationalities.

The objectives of the inspection mission were broadly

- to supervise the destruction of key technical installations comprising buildings and equipment at the Al Atheer-Al Hatteen site.

- to observe the transfer of irradiated fuel into new storage tanks.

- to perform nuclear material accountancy follow-up activities.

- to further investigate the work done in enrichment, particularly by the centrifuge method.

- to further investigate and assess the extent of the Iraqi experiments and studies in the area of weaponization.

- to continue field activities related to the foreign procurement of equipment used or capable of use in Iraq's nuclear program and to continue with the identification and cataloguing of such equipment.

- to discuss the draft report submitted by Iraq in March on its nuclear programme and the plan for future ongoing monitoring and verification.

These objectives were assigned to three groups within the overall team, with a group leader responsible for co-ordinating the work of each group. A total of 17 facilities and sites were inspected. These are shown in Table 1.

Table 1

List of facilities and sites inspected

1. Tuwaitha site and associated locations (Locations A, B, C, Ash Shaykhili storage, Al Nafad storage).
2. Tarmiya site.
3. Al Atheer site.
4. Al Qa Qaa site.
5. Ash Sharqat site.
6. Al Jezira site, including uranium waste location.
7. Al Furat site.
8. State Enterprise for Heavy Engineering Equipment (Daura).
9. Badr Complex.
10. Al Radwan
11. Al Ameer

}Part of Auqba Bin Nafi Establishment

12. Nassr Establishment (Taji).
13. Shuaia site (Nassr subsidiary).
14. Al-Rabee site.
15. Al-Dijla site.
16. Iskandariyah State Enterprise for Mechanical Industries.
17. National Computer Centre, Baghdad.

SUMMARY

2. On 25 March 1992, following a series of meetings in Vienna between IAEA officials and an Iraqi technical delegation, a formal communication containing a list of buildings and equipment to be destroyed at the Al Atheer-Al Hatteen site was transmitted to the Iraqi authorities.

The communication specified that destruction meant the physical demolition of buildings and that, in the case of equipment, it was to be conducted in such a way that the items in question and their constituent components could thereafter serve only as scrap. Further, it was stated that the eleventh IAEA inspection team would supervise the destruction operation.

Eight buildings, covering a surface of approximately 35 000 square meters, and 29 equipment items, some consisting of several components, were designated for destruction. In view of the extensive preparatory work required for the demolition operation, it was possible to complete the destruction of only about 24 000 square meters of buildings; however, most of the equipment was destroyed.

Throughout the destruction operation, the Iraqi side provided all the equipment, materials and manpower necessary for ensuring quick and satisfactory fulfillment of the agreed destruction plan under the supervision of the IAEA team.

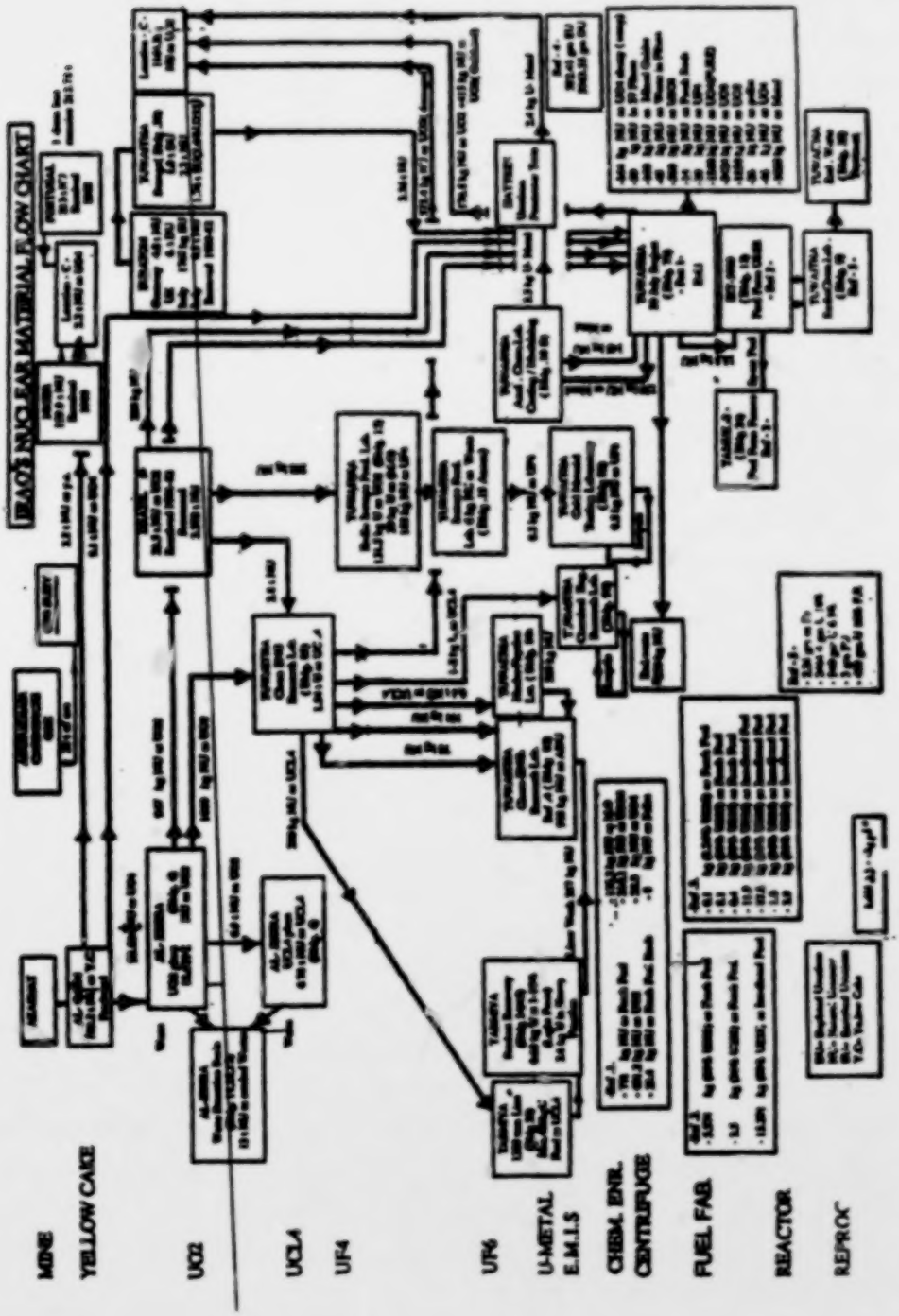
3. In response to a request made by the Iraqi authorities on 8 December 1991, the inspection team supervised the transfer of the irradiated HEU fuel from the Tamuz II and IRT-5000 reactors - which was being stored in a farm area near Baghdad (Location B) - to new concrete containers. This operation, which was organized and executed by the Iraqi side, was necessary in order to limit problems due to further corrosion of the fuel cladding.

4. The discussions relating to the nuclear material balance continued and, as a result, new information regarding nuclear material quantities and flows was provided by the Iraqi side. In the information provided, the quantity of yellow cake from the Al Qaim facility was larger than what had been indicated previously and there were changes as regards the origin of some processed nuclear material and the designation of the location in Tuwaitha where the production of certain material - including uranium metal - had been carried out. The implications of this information as regards the program and the overall nuclear material flow are being studied. Meanwhile, in response to a team request the Iraqi side has transmitted to the IAEA (under cover of a letter dated 22 April 1992) a "final revised version" of the nuclear material flow. This is presented in Figure 1.

5. The efforts to resolve inconsistencies in the declarations regarding Iraq's uranium enrichment programme continued during this inspection mission. A large number of questions were submitted to the Iraqi side. Some information was provided, including confirmation regarding some companies which assisted in the manufacturing of centrifuge parts. However, the primary grey areas - related to the procurement of carbon fibre rotors and maraging steel, sources of centrifuge technology advice and the extent of the chemical enrichment work - remained as open issues. The Iraqi authorities stated that they expected that these issues would be resolved during the next inspection mission.

6. In the area of weaponization, a number of meetings were conducted with experts from Al Atheer and Tuwaitha regarding weaponization requirements, with experts from Al Qa Qaa regarding its role in the programme and the production of plane wave explosive lenses, and with experts from the Al Hatteen establishment regarding their high explosives test facilities. The meetings were supplemented with inspections at these sites. The die which was declared at Al Qa Qaa as having been used to manufacture explosive lenses was removed from Iraq by the team. The NEC-750 computer used in the weaponization studies was inspected at the Iraqi National Computer Centre in Baghdad.

Figure 1


IRAQ'S NUCLEAR MATERIAL FLOW CHART
MINE
YELLOW CAKE
UO2
UCL4
UF4
UF6
U-METAL E.M.I.S
CHEM. ENR. CENTRIFUGE
FUEL FAB.
REACTOR
REPROC.

7. Twelve sites were revisited to complete the inventory and manufacturer identification of equipment and machine tools used or capable of use in the Iraqi nuclear programme. The inventory includes such equipment as computer numerical controlled (CNC) machines for flow forming, turning and milling, co-ordinate measuring machines (CMM) and electron beam welders (EBW) with designations varying from "key equipment" to "equipment for general use". The manufacturers of most of the machine tools have been identified and follow up actions are pending.

8. On 13 March 1991, the Iraqi delegation attending meetings of the Security Council handed over to the IAEA Action Team a draft of the "full, final and complete" report on Iraq's nuclear program. A number of meetings took place to discuss this report and also the plan for the future ongoing monitoring and verification of Iraq's compliance with paragraph 12 of part C of Security Council resolution 687 (1991) and with the requirements of paragraphs 3 and 5 of resolution 707 (1991). As a result of the discussions, the Iraqi authorities are planning to submit a revised version of the report to the IAEA for further discussion before finalization of the document. The Iraqi authorities requested that the IAEA provide clarification of a number of items identified in Annex 3 of the long-term plan.

9. A full record of the correspondence between the Chief Inspector of the eleventh IAEA inspection team and the Iraqi counterpart is given in Annex 1.

DESTRUCTION OF KEY TECHNICAL INSTALLATIONS AND EQUIPMENT

10. On 25 March 1992, following a series of meetings in Vienna between IAEA officials and an Iraqi technical delegation, a formal communication containing a list of buildings and equipment to be destroyed at the Al Atheer-Al Hatteen site was transmitted to the Iraqi authorities. The communication specified that destruction meant the physical demolition of buildings and that, in the case of equipment, it was to be conducted in such a way that the items in question and their components could thereafter serve only as scrap. Further, it was stated that the eleventh IAEA inspection team would supervise the destruction operation.

11. Eight buildings covering a surface of approximately 35 000 square meters, and 29 equipment items, some consisting of several components, were designated for destruction. It was possible to destroy approximately 24 000 square meters of buildings and most of the equipment during the eleventh mission. The success in this area was due to the full support of the Iraqi authorities, who wish to complete the job and are preparing the remaining buildings and equipment for destruction during the next IAEA inspection mission. A map of the Al Atheer-Al Hatteen site is presented in Figure 2.

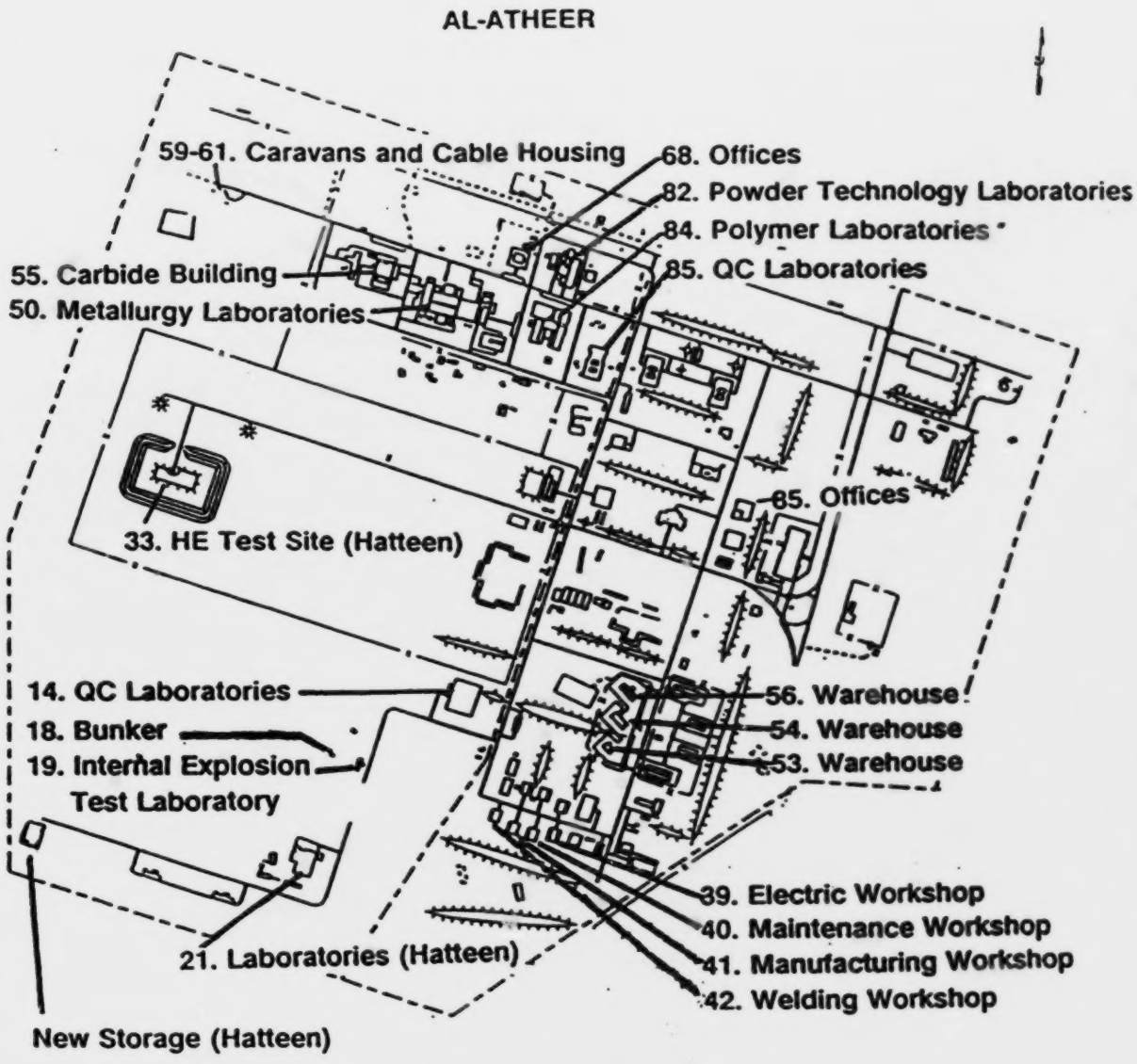
12. The techniques employed included the use of explosive charges (in total 3.5 tons of dynamite were used). The large bunker at the Al Hatteen site was filled with concrete and scrap iron to prevent its further use (350 cubic meters of concrete were poured); the use of explosives in this case was judged to be impractical. Cutting torches were used to destroy the steel liner shell of the internal explosion test chamber (Building 18) and to cut off reinforcing bars on this building and the cell in Building 21; that rendered these structures useless. Throughout the destruction operation, the Iraqi side provided all the equipment, materials and manpower necessary for fulfilling the destruction plan under the supervision of the IAEA team.

13. The status as of 15 April 1992 was:

1.	Building 33	Bunker destroyed by filling with concrete. Berm started to be levelled with bulldozer.
2.	Building 18	Explosion chamber destroyed by cutting torches.
3.	Building 19	Control Building destroyed by explosives.
4.	Building 21	Physics Building destroyed by explosives. Cell foundation destroyed by cutting.
5.	Building 50	Casting Building destroyed by explosives.
6.	Building 55	Carbide Building - about 20% destroyed by explosives.

The destruction of the rest of Building 55 will be completed during the next inspection mission, along with the destruction of Building 82 (Powder Building) and Building 84 (Polymer Building).

Figure 2


AL-ATHEER
59-61. Caravans and Cable Housing
68. Offices
82. Powder Technology Laboratories
84. Polymer Laboratories
85. QC Laboratories
55. Carbide Building
50. Metallurgy Laboratories
85. Offices
33. HE Test Site (Hatteen)
14. QC Laboratories
18. Bunker
19. Internal Explosion Test Laboratory
56. Warehouse
54. Warehouse
53. Warehouse
39. Electric Workshop
40. Maintenance Workshop
41. Manufacturing Workshop
42. Welding Workshop
21. Laboratories (Hatteen)
New Storage (Hatteen)

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14. Parallel to the destruction of buildings, the following equipment related to the nuclear programme was destroyed at Al Atheer: isostatic presses, vacuum furnaces, machine tools, a plasma spray system, a coordinate measurement machine, and viewing windows for explosive testing bunkers. A list of the equipment is given in Table 2. Destruction was carried out in such a way that the items now have only scrap value. Pressure vessel lids, hydraulics systems and the rails of large isostatic presses were destroyed but, for safety reasons, additional instructions are needed for the destruction of the pressure vessels. The work will be completed during the next mission. The small (ABRA) isostatic presses were destroyed by cutting yokes and destroying hydraulic fluid pumps and electronic control boards. Vacuum furnaces (Pfeiffer) were destroyed by cutting vacuum vessels, any inner parts and pumps (Balzers) into pieces. The control and HV power supply units of the vacuum furnaces were also destroyed. The control units and motors of the robot for the plasma spray systems (Plasmatechnik) were destroyed. The vacuum chamber and the filter unit were cut into pieces. Spindles, housings and other vital parts of a superprecision lathe (Hardinge Brothers), a jig grinding machine (Waida), and a precision turning machine (Schaublin) were cut. As regards the 3-axis coordinate measuring machine (Leitz), additional information is being sought from the manufacturer; the machine was disabled by taking some vital parts of the control units into the custody of the IAEA. The metal parts of viewing windows were cut and the glass windows destroyed.

ACTIVITIES RELATED TO NUCLEAR MATERIAL

15. Past reports have described a number of inspection activities related to the verification and control of the irradiated fuel from the Tamuz II and IRT reactors stored at Location B (a farm area north of Tuwaitha). Early in December 1991, the Iraqi authorities informed the IAEA Action Team of a developing problem with water chemistry in the Location B storage tanks: the winter rains were causing a rise in the level of the water table, which was resulting in the seepage of salt-containing groundwater into the tanks. The situation was temporarily improved during the tenth mission by cycling fresh water through the tanks. However, during this operation it was observed that the extent of corrosion in the fuel cladding was greater than expected and that a more stable storage environment was needed quickly. Several options were examined. The

Table 2

List of destroyed equipment

Equipment	Manufacturer	Status
Cold isostatic press	ASEA-Brown Boveri	Pressure vessel to be destroyed during IAEA 12
Hot isostatic press	ASEA-Brown Boveri	Pressure vessel to be destroyed during IAEA 12
Cold isostatic press	ABRA	Completed
Hot isostatic press	ABRA	Completed
Resistance furnace	Pfeiffer	Completed
Resistance furnace	Pfeiffer	Completed
Induction furnace	Pfeiffer	Completed
Vacuum furnace	Pfeiffer	Completed
Vacuum furnace	Pfeiffer	Completed
Vacuum plasma spray system	Plasmatechnik	Completed
Atmospheric plasma spray system	Plasmatechnik	Completed
Precision turning machine	Schaublin	Completed
Superprecision lathe	Hardinge Brothers	Completed
Jig grinding machine	Waida	Completed
3-axis coordinate measuring machine	Leitz	Some key components removed by IAEA; additional information from manufacturer sought
Viewing windows	not determined	Completed

one chosen was to place new concrete containers adjacent to each of the buried containers at Location B, pile dirt around the containers for additional shielding, manufacture new steel baskets to hold the fuel elements inside the containers, fill the containers with demineralized water and transfer the irradiated fuel. Most of the preparatory work was done by the Iraqi side prior to the arrival of the inspection team. The transfer was carried out during a four-day period (11-14 April) under the observation of IAEA inspectors. IAEA seals on two of the old containers were found to be broken. This appears to have been an inadvertant result of the movement of heavy equipment around the site. The fuel elements in these containers were re-verified prior to transfer. The new containers were again sealed as the transfers were completed. A total of 124 fuel elements, two natural uranium blocks and seven beryllium blocks were transferred to fourteen new tanks. Owing to a high radiation level, six fuel elements with control rods were left in an old tank.

16. This difficult task was accomplished without incident. The Iraqi side made an extraordinary effort to complete it during the eleventh inspection. The risk of a radiological incident at Location B has been reduced, but the problem remains. The importance of removing these materials from Iraq is therefore again emphasized.

17. Meetings with the Iraqi side in an attempt to resolve a variety of inconsistencies in the declarations describing the flows and processing of nuclear materials within the Iraqi programme continued throughout the inspection. A new declaration from the Iraqi side regarding the sources and amounts of materials, subsequent processing and the end-user for nuclear-material-related work carried out at Tuwaitha was presented to the team on the last day of the inspection. Important elements of the new declaration are summarized below:

- The amount of UO_4 powder produced at Al Qaim was given as 168 tonnes, as against 164 tonnes previously declared.

- Fourteen tonnes of Al Qaim UO_4 powder had been sent to Tuwaitha, (Building 73) to be converted to UO_2 and then to UF_4 and uranium metal. In addition, 375 kg of natural uranium (as UO_2 produced at Al Jezira) and 220 kg of natural uranium (as UO_2 from Brazil) had been sent to Building 73 for the same purpose.

- Uranium in various forms (including uranium metal) had been produced in Building 73 instead of Buildings 15 and 85 (Tuwaitha) as originally declared. The new Iraqi declaration is presented in Figure 1.

The IAEA's assessment of the flow and associated production (type and location) of nuclear materials in Iraq has changed substantially as a result of this declaration. The implications as regards the overall Iraqi programme and previous nuclear material verifications are currently being evaluated.

18. Other nuclear-material-related inspection activities carried out during the eleventh IAEA inspection mission were:

- The re-verification of nuclear material previously placed under IAEA safeguards (primarily LEU with ~2.6% U235) and its transfer from the New Storage Location (Building 50, Tuwaitha) to Location C. Building 50 had been damaged during the hostilities and its condition is continuing to deteriorate.
- Enrichment measurements (NDA), sampling (enriched material only) and re-packaging of Tuwaitha EMIS materials which were presented to the IAEA team in the course of the tenth inspection mission. The small quantities of HEU, in solution, will be "rendered harmless" by dilution with solutions containing natural or depleted uranium once the material accountancy issues involving this material have been resolved.
- The re-verification of the irradiated fuel assemblies remaining in the IRT reactor. Periodic re-verification is required as long as this material (unsealed) remains in Iraq.
- The checking and replacement of seals on the Tuwaitha hot cells. This included seals in Buildings 9, 15, 35 and 64.

ACTIVITIES RELATED TO THE ENRICHMENT PROGRAMME

19. The efforts to resolve inconsistencies in the declarations regarding Iraq's uranium enrichment programme continued during the eleventh mission. A large number of questions, together with several remaining from the tenth mission, were submitted to the Iraqi side during a meeting on the first day. The questions were discussed in detail. Some information was provided during the meeting and the Iraqi side promised

complete, written responses before the end of the mission. While progress was made on some items, particularly as regards details of the EMIS program, the primary grey areas - related to the procurement of the carbon fibre rotor tubes and the maraging steel, the source(s) of centrifuge technology advice and the dimensions of the Iraqi chemical enrichment work - remain unresolved.

20. The inadequate response from the Iraqi side prompted several intensive discussions. The initial Iraqi position was that a decision had been taken not to disclose the source of centrifuge technology advice and information related to the procurement of the carbon rotors and the maraging steel (the Iraqi side maintains that the work on chemical enrichment has been fully disclosed). The Iraqi side later indicated that the decision was being re-evaluated, and a meeting was arranged with the Chairman of the IAEC to discuss the problem. Questions regarding procurement and the source of advice, with particular emphasis on the Iraqi commitment during the tenth mission to clear up the grey areas, were submitted again. The meeting with the IAEC Chairman occurred in the evening of the last day of the mission. The Chairman indicated that the matter was being discussed at the highest levels and requested the inspection team regard it as an "open issue", with the expectation that it would be resolved at the time of the next inspection.

21. The Iraqi side has not yet responded to the crucial questions regarding procurement for the centrifuge program. The responses to more general questions regarding the organization of the centrifuge development effort and the extent of the work with chemical enrichment and gaseous diffusion are incomplete. However, information was provided that has assisted in clarifying a number of details:

- The Iraqi side stated that the small components for the centrifuge prototype were manufactured outside Iraq by three companies - C. Plath, Schaublin and Matrix Churchill; that forgings for the manufacture of maraging steel end caps and baffles sufficient for the planned 100-machine experimental cascade were being shipped from SMB Schmiedemeccanica SA to Iraq when they were stopped at Frankfurt airport and returned to the shipping firm; that fifteen CNC machine tools (turning and milling) for the centrifuge programme had been procured from Schaublin (ten of the machines had been delivered - currently under seal at Badr - and five are still with the company).

- The Iraqi side acknowledged the receipt of five 28KVA frequency converters from Acomel, but stated that this equipment had been damaged during the war and salvaged for parts. An attempt will be made to recover components for presentation to an inspection team.

- The existence of two Leifeld horizontal flow turning machines (ST-5690) in Iraq has been acknowledged. The Iraqi side stated that these machines did not belong to the nuclear programme. One was described as destroyed (inspected by the fourth UNSCOM ballistics team) and the other as being in use at the Iskandariya car factory.

- The Iraqi side continues to maintain that a potting/casting machine for the manufacture of centrifuge stator motors was never delivered. The resin castings done before the war were done manually. The Iraqi side could offer no explanation as to why the resin system used in casting the motor stators (declared to have been done in Iraq) and that used in the manufacture of the carbon fibre rotors (declared to have been done outside Iraq) are identical. The Millitorr resin mixing and discharge machine used in the manufacture of EMIS magnet coils was identified and inspected (Warehouse 7, Ash Shaykhli).

- The quantity of ferrite powder presented for inspection - declared during the ninth IAEA inspection mission to have resulted from the destruction of the ferrite magnets - is about a third of that expected. The Iraqi explanation was "The pieces of ferrite magnets were destroyed using a large hammer. As a result, some turned into powder and some scattered in the surroundings. The scattered material was collected and, as it was difficult to re-hammer it to produce powder, it was melted with charges under way in the foundry. All powder collected was presented." The site of the hammering at Iskandarya was visited by the inspection team. The Iraqi explanation is plausible, but there is no way to verify it.

- The Iraqi side again asserted that work on EMIS began after the destruction of the Osirak reactor in 1981. It was explained that the 1978 facility modifications to increase the floor loading capacity in part of Building 73 were carried out in order to accommodate the pre-assembly and cold testing of equipment destined for installation in the channels of the Osirak reactors.

- The primary components (drive motors and jigs) for both the 600mm and the 1200mm coil winding machine were identified and inspected at the Al Nafad storage area. They have been destroyed. The Iraqi side confirmed that the 600mm coil winding machine had been installed in Building 406 (Al Hamath). A number of the Osaka D-28 diffusion pumps that had been installed at Tarmiya were identified and inspected at Al Nafad. There appear to be remnants of twenty pumps - Osaka, Balzers and Leybold - at this location.

- Project 418 was identified by the Iraqi side as a store for corrosives constructed outside the berm at Tuwaitha (Warehouse 27B, Ash Shakiyili). The facility was inspected, and its layout was found to match that described in a PC-3 document. Previous inspection data indicated that Iraq was in possession of containers (5A, 8A, 12A and 12B) suitable for the storage of UF_6. This, at least in part, has been acknowledged, the Iraqi side stating that these containers were being used by industry outside the nuclear programme. The Iraqi side had managed to retrieve two of type 5A and 20 of type 8A, and these were presented for inspection. The search for others will continue.

- The Iraqi side asserted that all available fluorinated oil had been presented. The procurement of much larger amounts for both the EMIS and the centrifuge programs was acknowledged, but the Iraqi side stated that there had been large losses due to operational difficulties and further losses during the hostilities.

22. Follow-up visits to the Tarmiya, Ash Sharqat, Al Jezira and Al Furat sites were conducted during the eleventh mission:

Tarmiya - Apart from the transformer repair work continuing in Building 245 (the building designed for the installation of the 600mm EMIS units), the work at the site has been devoted to clean-up. All rubble has been cleared away. There has been movement of equipment, but it seems to have been internal to the site for the purpose of facilitating the clean-up effort. The front of Building 62, where the nuclear material (EMIS solutions) is stored, has been repaired. Building 216 (Iraqi Building 250) is essentially non-existent; only the concrete supports are in place. This building was

referenced in a PC-3 document as the planned location for enriched uranium metal production. The Iraqi response is that the document contains the results of a paper study which was never implemented and that Building 216 was to be utilized for enriched uranium waste recovery.

Al Jezira - The transfer, begun during the tenth inspection mission, of uranium waste liquid and slurry from the petroleum tank (at the Mosul Tank Farm, about 25 km west of Al Jezira) to the settling tanks at Al Jezira is more than 95% complete. Samples were taken at both locations. Once the liquid has evaporated, the dried sludge will be recovered and shipped to Location C, Tuwaitha. Equipment from the Al Jezira facility has been brought together in an open air storage area adjacent to the facility. Most of this equipment is destroyed and was inventoried at Location 6 during the third mission. Four pieces of major equipment (a reduction furnace, two chlorinators and a calciner) were sealed for identification. The Iraqi side declared that, other than the waste and equipment transfer, there had been no activity at the site since the first visit by an IAEA team, in July 1991. The inspection team observed nothing to disprove this.

Ash Sharqat - This facility was severely damaged during the war. Salvage activities are continuing. Side panels from buildings, doors, metal from ventilation ducts, electric cables, etc. are being removed from buildings to several open air storage locations.

Al Furat - There has been no activity at Al Furat since the site was first visited, in July 1991. The primary objective - to improve the photographic record of the site - was achieved.

ACTIVITIES RELATED TO THE WEAPONIZATION PROGRAM

23. The Iraqi side reiterated that Iraq had not had a program to develop a nuclear weapon; the goal had been to "define the requirements" in case a political decision to proceed with weapons development was taken. There had been no particular specifications or limits (e.g. dimensions or weights imposed by a delivery system). The Iraqi authorities had decided to go for the most complicated solution, i.e. an implosion system, because, in their view, defining its requirements would generate the expertise necessary for a simpler system, such as a gun-type system. The weapons studies had been based on HEU rather than plutonium as the fissile material because it had been considered by the Iraqi side to be the more difficult route.

24. In the meetings with IAEA team members, the Iraqi side stated that "defining requirements" meant gaining a complete understanding of all the steps necessary for producing a reliable device. A paper would have been written when the various aspects of the programme had been completed. Although experimentation would have been necessary, no full nuclear test had been planned. The inspectors took specific comments to mean that a full-scale model of a device would have had to undergo simulation testing of all components for this goal to be met. It was unclear when the programme would have ended.

25. The Iraqi side kept to its earlier explanation of the weapon design activities of PC-3 Group IV: the aim had been to investigate the problems of designing a complicated type of weapon so that the resulting technology and expertise could be applied to a simpler system if a political decision to proceed was taken. It was clear that, under such circumstances, PC-3 would then have had access to any facility in Iraq.

26. Explosives technology was acknowledged by the Iraqi side to have been a weak point in the design work. All PC-3 work had been carried out by PC-3 staff because of security considerations. No outside expertise had been contracted for within Iraq. The explosives and detonator experience within the PC-3 staff was stated to have been minimal, the intention being to learn as the programme progressed. The Iraqi side indicated that the fissile material aspects of the design had not been a problem, because that was where the PC-3 staff had experience.

27. The Iraqi side stated that the design for a plane wave lens was taken from the open literature. PC-3 had produced drawings of the lens which were then passed to Al Qa Qaa. The staff at Al Qa Qaa was not asked for any advice on the design of the lenses or high explosive work. PC-3 asked Al Qa Qaa for detonators to carry out the plane wave tests, but gave virtually no specifications as to their size, use, jitter time, reliability, etc. The inconsistency in these two positions was not clarified. The detonators eventually supplied were of low quality ("hot wire" devices). This was thought to be sufficient for the 20 experiments, because these were intended only to demonstrate how the plane wave lens worked. Simple instrumentation was used to measure the "speed" of the lens, but attempts to measure the planarity of the wave front failed.

28. The Iraqi side stated that, although it had calculated the required output for the main high explosive charges of a weapon design and had at least started to investigate initiation of the charges by plane wave lenses, no work had been carried out on the type or amount of high explosive required.

29. The Iraqi side showed the inspection team a small 63 tonne hydraulic press in Al Qa Qaa that was declared to have been used to produce the plane wave lenses. The Iraqi side also presented the pressing dies declared to have been used to produce the plane wave lenses. The sizes and shapes are wrong for the production of the lenses declared by the weapon designers. This needs clarification. The die was removed from Iraq to the IAEA's Headquarters in Vienna.

30. The Iraqi side stated that there had been no formal relationship between PC-3 and Al Qa Qaa but that the Establishment had performed work for them: it had produced approximately 20 pressings, each consisting of two explosives, RDX and baratol. The process used to provide the two-component, dual-press lenses was described in some detail. RDX had been available on-site. The baratol had been fabricated locally from available raw materials. Baratol is not normally used for any other purposes at Al Qa Qaa. This work had been performed in response to a work order and on the basis of drawings (copies requested). The Al Qa Qaa staff had no knowledge of the end use of the pressings. Quality control of the product was said to have consisted only of overall density and dimensional checks of the initial and final pressings. No material control or density variation checks had been carried out. No destructive or radiographic examinations had been made of the explosive interface. The pressings had been produced in a single campaign and delivered to PC-3 representatives. The only other work for PC-3 had been connected with detonators; it was described as consisting of attempts to buy detonators from the United States and of the purchase of explosive bolts for the joint Al Abid "missile" staging work. These latter two items failed to produce the desired results.

31. Work on the development of special detonators outside the Al Qa Qaa normal production line for hot wire systems was denied. On the instructions of PC-3, there had been an unsuccessful attempt to purchase exploding bridge wire (EBW) detonators from abroad. It was denied that there had been any Al Qa Qaa effort to develop EBW detonators. Further, it was stated that the only development efforts had been directed to making process improvements in the normal product lines. Work had been done at Tuwaitha on developing EBWs and simultaneity tests had been conducted there. These had been tests of the bridge wires only.

32. The inspection of the firing area and a storage bunker at Al Qa Qaa confirmed the earlier report of a low technology firing area. The storage bunker appeared to be of modern construction and contained metal detonating cord, fuses, detonators and boosters.

33. The inspectors were told that the Iraqi side had had little or no concern about its ability to deal with the fissile metallurgy. This contrasts with a piecemeal approach to the explosives and detonator systems. The explosives development campaign was to have been carried out by nuclear engineers with no previous explosives experience - a major challenge. The initiator design was also cited as a major stumbling block. In comparison to the comprehensive and well organized campaigns to produce fissile material in PC3, the information on this declared programme appears incomplete.

34. The design of the cylindrical neutron initiator declared by the Iraqi side is more consistent with a gun-type device than with the declared implosion weapon. The Iraqi side denied any effort to develop a gun-type device. It indicated that open literature sources had inspired the alpha-neutron initiator designs. Work on spherical initiators had not progressed beyond a literature survey, according to the declaration.

35. The Iraqi side reiterated that PC-3 had had no part in the design of the Al Hatteen buildings at the Al Atheer site. Of these buildings, only Building 33 (the bunker at the high explosives testing site) had been used by PC-3. The experimental work had been carried out by PC-3 staff without the assistance of the Al Hatteen establishment or anyone else. The Al Hatteen designers stated that the containment buildings had been designed at their request for the fragmentation testing of mortar shells. They had

specified what features they needed for their mortar shell testing work, but the facility design work had been done by an outside firm. The detailed specifications regarding hardness to explosions etc. had not been given by the Al Hatteen designers. The Al Hatteen designers could not comment on the inspectors' evaluation that the buildings were grossly overdesigned for mortar shell testing.

36. The objective of the visit to the National Computer Centre (NCC) in downtown Baghdad was to inspect the NEC-750 computer mentioned several times in the PC-3 reports. This mainframe computer was not able to run, owing to hard disk controller problems on the disk supporting the system. It was impossible to get any information about the files existing in the mass storage. The management of the NCC explained that since 17 January 1991 this computer had been out of order. Some damage was visible. In addition, a CII Honeywell Bull 66/20 computer (three elements) was situated in the back part of the same room.

37. The NEC-750 had been a medium to large mainframe computer when it had been bought in 1985 directly from the NEC company. According to the Iraqi side, the operating system had not been updated since 1985.

38. It was stated that the NCC was open to any customer who needed computational support (ministries, universities, companies, etc.) and that its staff generally had knowledge of customers and their activities - but had had no knowledge of PC-3 or its computational requirements. Before the war, the number of NCC customers had been 88. The Iraqi side stated that there was no particular system for dealing with the priority or duration of jobs. Long computations would have needed direct interaction between users and computer staff. The Iraqi side described the method of billing when the computer was operational, but could not recall billing PC-3 or the Ministry of Industry and Military Industrialization.

39. In response to the inspection team's request, the Iraqi side provided four computer diskettes containing a classical equation of state code, a molecular dynamic code and one-dimensional hydrodynamic codes. These codes are being evaluated. Additional questions were asked of the PC-3 management in an attempt to obtain a clearer picture of the Iraqi nuclear weapons programme. Answers have not yet been received.

ACTIVITIES RELATED TO EQUIPMENT AND MATERIALS

40. During the ninth inspection, the Iraqi authorities declared 96.75 tonnes of maraging steel, which had been melted and poured into ingots. During the ninth and tenth inspections, material was sampled; the results proved that the steel presented at the State Establishment at Iskandariya had a chemical composition corresponding to maraging steel. Expert judgement was that the material could be recovered. Remelting the ingots together with a suitable quantity of carbon steel would destroy the unique steel alloy by significantly increasing the carbon content. To test the feasibility of the approach, about 1 tonne of maraging steel was melted with equal amounts of scrap steel and the melt sampled to determine whether the technical properties had been sufficiently changed. There were, however, some technical obstacles due to the embargo. Should melting electrodes or liners be made available, it would take up to one month of three-shift work to complete the task at Iskandariya. If another foundry is made available, the time may be shortened, but removal of the material from Iraq is being considered as a serious alternative.

41. The team visited manufacturing facilities associated with the Iraqi nuclear programme to make an inventory of key machine tools and to see how they were currently being used. The State establishments visited were Badr (Al Ameen), Auqa Bin Nafi, Badr, Nassr (Taji and Schuala), Al Radwan, Al Ameer, Al Dijla and Al Rabiyah. These facilities were included in the Iraqi declaration of July 1991 as manufacturing facilities for the enrichment programme.

At each site the Director General was asked to state the current and past usage of major workshops. Based on the declarations, selected workshops were visited and equipment identified. The results are summarized in Table 3. Key machines are those which are mentioned in Annex 3 to the IAEA's plan for future monitoring and verification and/or those which have technical characteristics required for producing key components needed in a nuclear program. The key machines indicated are subject to monitoring, rendering harmless or destruction. The numbers shown in the table refer only to machines inspected during this inspection mission. To complete the picture, additional inspections at sites indicated above and at other sites are required in order to obtain sufficient knowledge for the long-term monitoring program.

Table 3

List of identified equipment

Type of Machine	Total Number	Number of Key Machines	Remarks
Flow forming, vertical	10	10	All under seal; Application-specific fixtures of one machine destroyed
Flow forming, horizontal	3	0	
Milling and/or boring, 5A	28	28	
Milling and/or boring, 4A	42	0	
Milling and/or boring, 3A	107	4	
Electric discharge, RAM or wire	16	0	
Milling	98	71	Two at Al Atheer have been destroyed
Grinding, including jig	11	1	One at Al Atheer has been destroyed
Drilling	1	0	
Jig bore	4	2	
Cutting, including plasma	6	0	
Electron beam welder	2	2	One under seal at Daura; one badly damaged
Coordinate measurement	14	4	
TOTAL	**342**	**122**	

OTHER ACTIVITIES

42. The team again visited Buildings 14 (physical properties) and 85 (characterization) at Al Atheer. These buildings are very ordinary laboratories and offices. The ventilation systems are small and do not have any filtration, but Building 14 does have several rooms with large internal recirculating air conditioning systems. There are no special sewers or waste systems. The instrumentation in these buildings is generally older and of normal university or industrial quality.

43. The Al Rabee facility south of Baghdad was revisited. Al Rabee was declared as a general machining facility that had supported the EMIS program before the war. The Iraqi side described the development and growth of this facility; two unrelated factories had been joined together at the beginning of the war to form the present Al Rabee complex. The newer portion had been developed by an unknown organization that was not represented at the meeting, and its original purpose was not described.

44. The team carried out a general inspection of virtually all the buildings in the complex and made an inventory of tools. Al Rabee is generally a modern machining facility with a good tool inventory and supporting equipment such as materials preparation, inspection, and chemical cleaning. The newer section is being used for general-purpose machine shop activities; it is slowly filling up with equipment as it is integrated into the overall Al Rabee facility.

45. The Dijla facility was also revisited. This is a facility for making electrical equipment such as controllers and power supplies. It was declared to have had a role in the EMIS program. At present the staff is working on industrial reconstruction. The team observed printed circuit board production, chassis construction and assembly, and inspection activities associated with general electrical power work. PC-3 personnel had worked with the staff of the Dijla facility, but the staff declares that it is a general Ministry of Industry facility and was in no way subordinate to PC-3 or the IAEC.

46. Extensive discussions were held on the document entitled "The Iraqi Nuclear Program Before and After Security Council Resolution 687 (1991)", which had been drafted by the IAEC and submitted to the Action Team in New York in March 1992. The Iraqi side stated that the document was intended to be the "full, final and complete" report ("FFC") on the Iraqi program and was being prepared in accordance with Security Council resolution 707. The IAEA side clarified that the discussions were being held in order to assist the Iraqi side in identifying areas on which further explanations or details were required.

47. The Iraqi side was advised that the FFC, which - in its current, draft form - tended to focus on aspects of the Iraqi programmme inspected by the IAEA teams, should be expanded to cover the whole Iraqi nuclear programme. It was also advised that there were significant aspects of Iraq's nuclear program which were not clear to the IAEA. Specific areas about which there existed inconsistencies in the Iraqi declarations (as compared with available data) included fuel reprocessing and enrichment. A better explanation of the timing of and justification for the various steps taken in the course of Iraq's nuclear programme was necessary.

48. The team also indicated that further details were required with regard to staffing, procurement efforts, the relationship with the Iraqi educational establishment and other training institutes, the relationship between the IAEC and PC-3, nuclear material flows, relevant facilities and their roles in the programme. It was pointed out that these were merely examples of areas about which questions remained.

49. The Iraqi side indicated that it would prepare a revised draft of the FFC and would like to have the IAEA's comments before finalizing it. To that end, it would submit a revised text to the IAEA.

50. Several meetings were held with the Iraqi side on the IAEA's plan for future ongoing monitoring and verification, which had been approved in to Security Council resolution 715. The discussions focussed on the requirements under the plan, those aspects with which Iraq had not yet complied and concerns raised by the Iraqi side in its interpretation and implementation of the plan.

51. In accordance with the requirements of paragraph 22 and Annex 2 of the plan, Iraq was to have provided by November 1991 (in English) detailed information concerning nuclear material, isotope facilities, equipment and its existing and proposed nuclear programmes. The information was to have covered the period since 1 January 1989 and to have included all relevant items in Iraq. The Iraqi side had provided only some of the information required, and had not included items which did not belong to the IAEC. Nor had the information covered the period since 1 January 1989. In addition, the notifications submitted by Iraq pursuant to these requirements had been only lists of items with cross-references to previous communications, letters, documents or discussions. The Iraqi side agreed to provide an update that would include the period since 1 January 1989 and expressed the hope that it would be able to provide details - not just cross-references - by the time the semi-annual report was due (15 July).

52. The Iraqi side explained a number of general concerns which it had with respect to the Annexes of the plan. Regarding the items listed in Annex 3 it raised a number of technical questions. The IAEA team was able to resolve some of these through clarifications. As to others, the team agreed to take note of the Iraqi concerns and review them in Vienna.

53. In the course of the sixth IAEA inspection mission the Iraqi authorities confiscated documents collected during the inspection of the PC-3 Design Centre. Not all of these documents were subsequently returned to the inspectors, who noted at the time that a number, including some of red-covered documents were missing. Inspection teams have since then requested the return of such documents. During the eleventh inspection mission, the Iraqi authorities presented a number of red-covered technical documents of the Iraqi Atomic Energy Commission covering progress reports, engineering notes and drawings for the Tammuz reators, the LAMA Hot Laboratory, the Radioactive Waste Transport Station and other such locations in the Tuwaitha Nuclear Research Center. All documents were dated from 1977 to 1981.

ANNEX 1

List of requests submitted and declarations received during the eleventh IAEA inspection mission

11-01. Mr. M. Zifferero to Mr. Al Hajjaj on 920325, regarding buildings and equipment to be destroyed at Al Atheer during the eleventh IAEA inspection mission.

11-02. Dr. H. Blix to Mr. Muhammad Said Al-Sahhaf, Minister of State for Foreign Affairs, regarding the destruction work to be performed at Al Atheer during the eleventh IAEA inspection mission.

11-03. Mr Al Hajjaj to Mr. D. Perricos on 920407, providing suggestions for the destruction of equipment and buildings at Al Atheer.

11-04. Mr. D. Perricos to Mr. Al Hajjaj on 920407, asking questions about the nuclear material balance.

11-05. Mr. D. Perricos to Mr. Al Hajjaj on 920408, asking for clarifications regarding the Iraqi enrichment programme.

11-06. Mr. D. Perricos to Mr Al Hajjaj on 920411, requesting drawings and equipment plans for Buildings 14 and 85 at Al Atheer, additional information on Building 101 at Al Atheer/Al Hatteen and drawings of the buildings to be destroyed at Al Atheer.

11-07. Mr. D. Perricos to Mr. Al Hajjaj on 920411, asking questions regarding the weaponization programme and plutonium.

11-08. Mr. D. Perricos to Mr. Al Hajjaj on 920412, asking questions regarding design, initiator, HE experiments, EBW tests, buildings involved, experimental equipment, numerical support and technology.

11-09. Mr. D. Perricos to Mr. Al Hajjaj on 920412, asking questions about the experiments at the Al Hatteen site.

11-10. Mr. D. Perricos to Mr. Al Hajjaj on 920413, on questions arising from the meeting at Al Qa Qaa on 920412.

11-11. Mr. D. Perricos to Mr. Al Hajjaj on 920414, on questions regarding the extension of the Al Rabee and Al Dijla factories.

11-12. Mr. D. Perricos to Mr. Al Hajjaj on 920414, asking for the location of the additional rollers of the flow forming machine (Daura) and the UF6 containers.

11-13. Mr. D. Perricos to Mr. Al Hajjaj on 920414, asking questions regarding the feasibility studies of an underground reactor.

11-14. Mr. D. Perricos to Mr. Al Hajjaj on 920414, asking for information on outside support for the enrichment programme and for details about the procurement of the carbon fibre rotors and the maraging steel.

11-15. Mr. D. Perricos to Mr. Al Hajjaj on 920414, acknowledging the removal from Iraq of certain key parts of a coordinate measuring machine.

11-16. Mr. D. Perricos to Mr. Al Hajjaj on 920414, acknowledging the completion of the destruction of Buildings 50, 55, 18, 19, 21, and 33 at Al Atheer and requesting preparatory work to be done for the remainder of Building 55 and for Buildings 82 and 84.

11-17. Mr. D. Perricos to Mr. Al Hajjaj on 920414, asking questions regarding the use of the NEC-750 computer at the National Computer Centre.

11-18 Mr. Al Hajjaj to Mr. Perricos on 920422, transmitting a final revised version of the Iraqi Nuclear Material Flow Chart. This is part of the response to item 11-04 above.

11-19. Mr. Al Hajjaj to Mr. D. Perricos on 920414, regarding the radiation exposures of people working at Location B during the eleventh IAEA inspection mission.

11-20. Mr. Al Hajjaj to Mr. D. Perricos on 920414, providing 3.5" programme diskettes with codes used in the weaponization studies.

11-21. Mr. Al Hajjaj to Mr. D. Perricos on 920414, providing the plans and describing the current situation of the equipment in the characterization and QC buildings at Al Atheer/Al Hatteen. This is a response to item 11-06 above.

11-22. Mr. Al Hajjaj to Mr. D. Perricos on 920414, providing the dies used for the production of the explosive plane lenses at Al Qa Qaa. This is part of the response to item 11-10 above.

11-23. Mr. Al Hajjaj to Mr. D. Perricos on 920414, requesting IAEA permission to reconstruct part A of Building 15 at Al Tuwaitha for pharmaceutical work not involving work with radioactive materials.

11-24. Mr. Al Hajjaj to Mr. D.Perricos on 920411, providing answers to questions about the centrifuge programme put by Mr. van Meurs on 920211.

11-25. Mr. Al Hajjaj to Mr. D. Perricos on 920414, providing a response to item 11-05 above regarding some details of the enrichment programme.

11-26. Mr. Al Hajjaj to Mr. D. Perricos on 920414, providing some "red cover" technical reports.

11-27. Mr. Al Hajjaj to Mr. D.Perricos on 920415, providing a response to questions regarding project organization and the codes used by the IAEC put in the 920304 letter from Prof. M. Zifferero to Mr. Al Hajjaj.